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Effect of intercropping on infestation of shoot and fruit borer (*Earias vittella.* Fab) on okra

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Abstract

An experiment was conducted at Indian Institute of Vegetable Research, Varanasi (India) Research field during *Kharif* season of 2007 and 2008 to know the infestation of shoot and fruit borer, *Earias vittella* (Fab.). The okra crop grown in mix crop with cowpea, moong, marigold and sole okra. The maximum infestation of shoot and fruit borer was observed on okra followed by okra + moong whereas minimum on okra + marigold followed by okra + cowpea.

Keywords: Intercropping, infestation, okra, shoot and fruit borer.

Introduction

The shoot and fruit borer, *Earias vittella* Fab. (Lepidoptera: Noctuidae) is an important pest of okra [*Abelmoschus esculentus* (L.) Moench]. Damage due to fruit borer account for nearly 45% in Karnataka (Srinivasan and Krishnakumar, 1983) and 25.93 to 40.91% in Madhya Pradesh (Dhamdhere *et al.,* 1985*)*.The larva of *Earias vittella* bores the growing shoot of okra plant prior to fruit formation resulting in withering and drying of shoot (Rai *et al*., 2014; Halder *et al*., 2015). On availability of fruit, larva starts feeding to the okra fruit and thus causes direct loss to yield. Intercropping is important cultural practice principle of reducing pests by increasing the diversity of an ecosystem (Risch, 2005). Several studies indicate that diversification practices as intercropping in pigeon pea and other crops are beneficial because these practices reduce pest (Srinivasa Rao *et al*., 2004; Songa *et al*., 2007). Cowpea is a short-duration pulse crop considered as an eco-feast crop, which attracts aphids, thus increasing occurrence of coccinellids (Surulivelu, 2004). Diversity in the crop field may have a profound effect on colonization by insects, and has been well–documented in the case of intercropping (Risch *et al.,* 1983). Baliddawa (1985) observed that up to 30% of pest reduction in intercropping systems could be due to the "natural enemy effect". Associational resistance refers to the reduced herbivore attack that a plant experiences when they are associated with taxonomically different plants (Kaitaniemi *et al*., 2007).

Material and Methods

The okra variety Kashi Pragati was grown at Indian Institute of Vegetable Research (IIVR), Varanasi, Uttar Pradesh, following recommended crop growing practices except plant protection. The experiment was conducted in factorial randomized block design. The seeds of okra were sown on 6th July, 2007 and 2008. The size of each plot was 3 x 2 m^2 with 1.0 m replication border and 0.5 m treatment border between the plots. The spacing between rows and plants were kept 60 and 30 cm, respectively. There were four treatments comprising of okra [*Abelmoschus esculentus* L. (Moench)] c.v. Kashi Pragati monocrop and intercropped with cowpea (*Vigna unguiculata* L.) c.v. CP-4, moong (*Vigna radiata* L.) c.v. HUM -16 and marigold (*Tagetes erecta* L.) c.v. Pusa Orange. In between two rows of okra, seedlings of marigold were transplanted. Similarly, seeds of cowpea and moong were sown in between two rows of okra. No pesticides were used during the period of experimentation. The experimental crop was monitored on regular basis to notice the incidence of *Earias vittella*. The observations were recorded at weekly interval by counting total number of shoot and fruit of five randomly selected to record the per cent shoot and fruit damage per five okra plant in each replication. The preference of intercrop combination was judged on the basis of shoot and fruit borer population per okra plant.

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Results and Discussion

The shoot borer infestation affected by different intercrops revealed that all the treatments were significantly superior in suppressing the incidence of shoot borer. The minimum incidence of shoot borer (14.9%) was recorded in the treatment okra + marigold followed by okra + cowpea (17.5%). The maximum shoot borer infestation (28.1%) was found on okra sole crop followed by okra + moong (24.3%) during the year 2007 (Table 1).

Similarly, during the year 2008, the shoot borer infestation observed in the treatments plots showed almost same trend. Okra intercropped with marigold received minimum shoot borer infestation (15.1%) followed by okra + cowpea (17.8%). The maximum shoot borer infestation (28.8%) was noted on okra sole crop followed by okra + moong (24.9%) (Table 2). First year trend was noticed in case of pooled data. It is obvious from the data that all the intercrops were significantly superior over okra sole crop. The minimum shoot borer infestation (15.0%) was recorded when okra was intercropped with marigold followed by okra + cowpea (17.6%) (Table 1). The Fruit borer infestation affected by different intercrops revealed that all the treatments were significantly superior in suppressing the incidence of Fruit borer. The minimum incidence of Fruit borer (18.5%) was recorded in the treatment okra + marigold followed by okra + cowpea (20.3%). The maximum fruit borer infestation (32.5%) was found on okra sole crop followed by okra + moong (28.5%) during the year 2007 (Table 2).

Similarly during the year 2008, the fruit borer infestation observed in the treatments plots showed almost same trend. Okra intercropped with marigold received minimum fruit borer infestation (17.8%) followed by okra + cowpea (19.2%). The maximum fruit borer infestation (30.2%) was noted on okra sole crop followed by okra + moong (26.2%). First year trend was noticed in case of pooled data. All the intercrops

Table: 1. Effect of intercropping on shoot damage by *Earias vittella* on okra during *kharif* seasons (pooled data of 2007 and 2008)

Treatments	Average shoot damage at different dates of observation								Mean
	5th Aug.	12th Aug.	19th Aug.	26th Aug.	2nd Sept.	9th Sept.	16th Sept	23rd Sept.	
Okra+marigold	6.7	13.3	24.9	18.3	14.7	17.5	17.4	7.0	15.0
	(8.9)*	(17.7)	(29.9)	(25.3)	(22.6)	(24.7)	(24.6)	(15.3)	(21.1)
Okra+cowpea	20.0	26.7	18.6	19.5	23.2	18.0	8.2	7.0	17.6
	(26.6)	(28.5)	(25.6)	(25.3)	(28.8)	(25.1)	(16.6)	(15.3)	(24.1)
Okra+moong	20.0	33.3	30.4	30.0	29.6	27.3	14.4	11.7	24.6
	(26.6)	(35.0)	(33.5)	(26.2)	(32.9)	(31.5)	(22.3)	(20.0)	(29.4)
Okra	20.0	33.3	34.7	30.1	29.8	32.0	29.3	18.4	28.4
	(26.6)	(35.0)	(36.1)	(33.2)	(33.1)	(34.4)	(32.8)	(25.4)	(32.6)
Mean	16.7	26.7	27.2	24.5	24.3	23.7	17.3	11.0	21.4
	(22.1)	(29.1)	(31.3)	(29.5)	(29.3)	(28.9)	(24.1)	(19.0)	(26.7)
Difference between the treatments				C.D.(P =0.05) = 0.79					
Difference between the period of observations				C.D.(P =0.05) = 0.97					
Difference between the treatments x period of observations				C.D.(P =0.05) = 1.21					

*Figures in the parentheses are arc sine transformed values.
Data presented in table are average of three replication, five plants in each replication.

Table: 2. Effect of intercropping on fruit damage by *Earias vittella* on okra during kharif seasons (pooled data of 200 7 and 2008)

Treatments	Average fruit damage at different dates of observation								Mean
	12th Aug.	19th Aug.	26th Aug.	2nd Sept.	9th Sept.	16th Sept	23rd Sept.	30th Sept	
Okra+marigold	13.5	13.1	19.8	25.5	34.6	12.8	12.4	8.0	17.5
	(21.5)*	(21.2)	(26.4)	(30.3)	(36.0)	(20.9)	(20.6)	(16.4)	(24.2)
Okra+cowpea	15.0	15.7	20.1	25.9	35.6	18.6	12.2	9.3	19.0
	(22.8)	(23.3)	(26.6)	(30.6)	(36.9)	(25.5)	(20.4)	(17.7)	(25.4)
Okra+moong	18.8	24.5	29.4	37.9	33.5	30.4	26.6	7.5	26.1
	(25.7)	(29.6)	(32.8)	(38.0)	(36.4)	(33.4)	(31.0)	(15.9)	(30.2)
Okra	20.0	29.3	31.0	43.2	40.5	39.1	26.5	10.0	29.9
	(26.5)	(32.7)	(33.8)	(41.1)	(39.5)	(38.7)	(31.0)	(18.4)	(32.7)
Mean	16.8	20.6	25.1	33.1	36.1	25.2	19.4	8.7	23.1
	(24.1)	(26.7)	(29.9)	(35.0)	(36.9)	(29.6)	(25.8)	(17.1)	(28.1)
Difference between the treatments				C.D.(P =0.05) = 0.43					
Difference between the period of observations				C.D.(P =0.05) = 0.22					
Difference between the treatments x period of observations				C.D.(P =0.05) = 0.69					

*Figures in the parentheses are arc sine transformed values.
Data presented in table are average of three replication, five plants in each replication.

were significantly superior over okra sole crop. The minimum fruit borer infestation (17.5%) was recorded when okra was intercropped with marigold followed by okra + cowpea (19.0%) (Table 2). The treatment response was also similar in pooled data.

A perusal data revealed that the minimum shoot and fruit damage was recorded when okra was intercropped with marigold followed by okra + cowpea. The appreciable reduction in borer infestation in okra inter-planted with either marigold, moong or cowpea may probably be due to certain volatile substances emitted by these intercrops which might have repelled and obstructed the entry of insect pest in the field. The present findings are in accordance with that of Lateef and Irwin (1979) who reported that various herbs grown as intercrops were responsible for preventing pests from locating their food due to their repellent properties. Prasad and Prasad (2004) have reported that the efficacy of insecticide against okra fruit borer and that of intercropping was in order of okra grown with marigold > okra gown with coriander > okra grown with French bean > okra grown alone. Vaiyapuri *et al*. (2007) reported that cotton intercropping with marigold in two rows in between cotton row and incorporating it on 30 DAS had contributed ultimately less incidence of pest. Jayakumar *et al*. (2008) reported that cotton + blackgram intercropping with 75% inorganic N + 25% through poultry recorded significantly lesser pest incidence.

सारांश

भिण्डी में तना एवं फल बेधक कीट के प्रकोप की जानकारी हेतु भा.कृ.अनु.प.–भारतीय सब्जी अनुसंधान संस्थान, वाराणसी के प्रक्षेत्र पर वर्ष 2007–2008 के खरीफ मौसम में किया गया। भिण्डी की मिश्रित खेती लोबिया, मूंग, गेंदा के साथ तथा भिण्डी को अकेले उगाया गया। तना एवं फल बेधक कीट का अधिकतम प्रकोप, भिण्डी + मूंग में पाया गया जबकि कमतर प्रकोप भिण्डी + गेंदा में पाया गया तथा इसके बाद भिण्डी + लोबिया का स्थान रहा।

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